from that usually adopted in that the principle of transmissibility of force is discarded ; while the conditions of equilibrium of all bodies, including liquids and flexible strings, are deduced from those of a single particle by means of D'Alembert's principle. The Newtonian definition of force is, of course, the one employed.

THE additions to the Zoological Society's Gardens during the past week include a White-fronted Capuchin Monkey (*Cebus albifrons*) from South America, presented by Mr. Matthews ; a Ring-tailed Coati (*Nasua rufa*) from South America, presented by Miss Agnes Shouman ; a Common Kingfisher (*Alcedo ispida*), British, presented by Mr. Cuthbert Johnson ; two Cambayan Turtle Doves (*Turtur senegalensis*) from Egypt, presented by M. J. M. Cornély, C.M.Z.S. ; a Chinese Mynah (*Acridotheres cristatellus*) from China, presented by Mr. T. Douglas Murray, F.Z.S. ; a Huanaco (*Lama huanacos*) from Bolivia, two Llamas (*Lama peruana*) from Peru, a Dingo (*Canis dingo*), a Roseate Cockatoo (*Cacatua roseicapilla*) from Australia, two Sonnerat's Jungle Fowl (*Gallus sonnerati*) from Southern India, seventeen Tuatera Lizards (*Sphenodon punctatus*) from New Zealand, deposited ; two White-eared Scops Owls (*Scops leucotis*) from West Africa, a Red and Black Lizard (*Ctenosaura erythromelas*), purchased ; two Geoffroy's Doves (*Peristera geoffroi*) from Brazil, two Blood-breasted Pigeons (*Phlogœnas cruentata*) from the Philippine Islands, received in exchange ; a Black Lemur (*Lemur macaco*), an Axis Deer (*Cervus axis*), born in the Gardens.

OUR ASTRONOMICAL COLUMN

AN ASTRONOMICAL DIRECTORY.—M. Lancaster, of the Brussels Observatory, has compiled and published a most useful list of observatories, with their geographical co-ordinates and the astronomers attached to them, of astronomical societies and institutions, and of reviews and journals specially devoted to astronomy. The pamphlet also contains a select list of the names and addresses of those astronomers who are not attached to any observatory, and of amateurs, as well as a further list of makers of astronomical instruments. As is practically inevitable in a work of this nature, there are faults both of omission and of commission noticeable in it. The most conspicuous of the former perhaps occurs in the account of the English *Nautical Almanac* office, where the staff is represented as consisting of the superintendent and *one* assistant. There are, we believe, as many as eleven assistants attached to this office. A good many mistakes have also been made in the addresses of individual astronomers. We hope that in a second edition M. Lancaster will be enabled to remove these blemishes from what must be considered, on the whole, as a very valuable publication, and one which ought to be in the library of every astronomer who is engaged in the active work of his profession.

ROUSDON OBSERVATORY, DEVON.—Mr. Cuthbert Peek has recently published a short *résumé* of his astronomical work during the years 1882-85, including a description of his private observatory near Lyme Regis. This observatory, of which a photograph is given, is solidly built, and seems to be very thoroughly equipped for its size. It contains a transit instrument, by Troughton and Simms, of 2 inches aperture ; an equatorial by Merz, mounting by Cooke, of 6·4 inches aperture ; solar and sidereal chronometers ; position-circle micrometer by Hilger, &c. Beneath the equatorial room is a room used as a laboratory and for photography. Of the observations, the most important is a monograph on the nebula surrounding η Argûs. Mr. Peek had joined the Expedition under the command of Capt. W. G. Morris, R.E., which was sent out to Queensland to observe the transit of Venus in 1882, and, whilst at Jimbour, the place selected as the observing-station, made the observations here recorded. The other observations are of comets 1883 *b* (Pons-Brooks), 1884 II. (Barnard), 1884 *c* (Wolf), Encke's comet, the lunar eclipse of 1884 October 4, occultations of Aldebaran, Saturn, Nova Andromedæ, and the meteor-shower of November 27 last. As the observatory was in course of erection during the years 1884 and 1885, and therefore no systematic work could be undertaken, this record must be considered as very satisfactory.

THE GREAT MELBOURNE TELESCOPE.—The first part of observations of the southern nebulæ made with the great Cassegrain reflector at Melbourne has just been published. Other parts, containing the results of observations for the revision of the southern nebulæ observed by Sir John Herschel at the Cape of Good Hope in the years 1834 to 1838, the work to which the tele cope has been chiefly devoted since its erection in 1869, are to follow at short intervals. The present part contains a description of the instrument itself and of the methods employed in using it, together with observations of some of the smaller nebulæ, and it is illustrated by two good photographs representing the great telescope and its surroundings, and by three lithographic plates of the nebulæ observed. The report as to the performance of the great telescope is to the effect that on the average of ordinary fine nights it is somewhat disappointing to one accustomed to observe with smaller apertures, but on *really good nights* it is quite different. So large an aperture, that is to say, requires specially good atmospheric conditions for its full powers to be displayed. The number of nights fit for using the telescope is given as about 40 per cent., but of best nights only 17 per cent. Moonlight nights are reckoned as bad nights, as, though used for lunar photography, they are unsuitable for the special work to which the instrument is devoted—the observation of nebulæ. The observations of the nebulæ given afford several remarkable instances of apparent changes having taken place in a few years. Nebulæ Nos. 187 and 567 ("Gen. Cat.") seem to differ from Herschel's description, and the group of four nebulæ—Nos. 962, 963, 966, and 968—appear to have altered in their relative positions in a very striking manner in the interval between Mr. Turner's observation in 1876·8 and Mr. Baracchi's in 1884·8. It seems very difficult to explain the differences between the descriptions of this group by Herschel, Turner, and Baracchi.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1886 APRIL 11-17

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on April 11

Sun rises, 5h. 15m. ; souths, 12h. 1m. 1·7s. ; sets, 18h. 47m. ; decl. on meridian, 8° 24′ N. : Sidereal Time at Sunset, 8h. 6m.

Moon (at First Quarter) rises, 10h. 15m. ; souths, 18h. 6m. ; sets, 1h. 52m.* ; decl. on meridian, 17° 41′ N.

Planet	Rises h. m.	Souths h. m.	Sets h. m.	Decl. on meridian ° ′
Mercury ...	4 56 ...	11 43 ...	18 30 ...	8 31 N.
Venus	3 48 ...	9 14 ...	14 40 ...	7 26 S.
Mars	14 9 ...	21 15 ...	4 21* ...	11 56 N.
Jupiter... ...	16 23 ...	22 37 ...	4 51* ...	2 2 N.
Saturn... ...	8 41 ...	16 53 ...	1 5* ...	22 51 N.

* Indicates that the setting is that of the following morning.

Variable-Stars

Star	R.A. h. m.	Decl. ° ′		h. m.	
Algol	3 0·8 ...	40 31 N. ...	Apr. 12,	23 38	*m*
			,, 15,	20 27	*m*
U Monocerotis ...	7 25·4 ...	9 32 S. ...	,, 12,		*m*
U Canis Minoris...	7 35·2 ...	8 39 N. ...	,, 12,		*m*
V Cancri	8 15·2 ...	17 39 N. ...	,, 12,		*M*
R Hydræ	13 23·5 ...	22 42 S. ...	,, 14,		*m*
δ Libræ	14 54·9 ...	8 4 S. ...	,, 11,	4 18	*m*
			,, 15,	20 0	*m*
R Coronæ	15 43·9 ...	28 30 N. ...	,, 17,		*m*
S Scorpii	16 10·9 ...	22 37 S. ...	,, 15,		*M*
U Ophiuchi... ...	17 10·8 ...	1 20 N. ...	,, 14,	3 52	*m*
		and at intervals of	20	8	
X Sagittarii... ...	17 40·4 ...	27 47 S. ...	Apr. 14,	2 20	*m*
			,, 17,	0 0	*M*
W Sagittarii ...	17 57·8 ...	29 35 S. ...	,, 13,	21 30	*M*
β Lyræ...	18 45·9 ...	33 14 N. ...	,, 13,	19 10	m_2
			,, 17,	0 0	*M*
R Lyræ	18 51·9 ...	43 48 N. ...	,, 12,		*M*
S Delphini	20 37·8 ...	16 41 N. ...	,, 13,		*m*
δ Cephei	22 24·9 ...	57 50 N. ...	,, 14,	21 40	*M*

M signifies maximum ; *m* minimum ; m_2 secondary minimum.

Occultations of Stars by the Moon (visible at Greenwich)

April	Star	Mag.	Disap.	Reap.	Corresponding angles from vertex to right for inverted image
			h. m.	h. m.	° °
13	ξ Leonis	6	20 0	near approach	342 —
14	48 Leonis	6	22 57	23 40	40 329
15	τ Leonis	5	21 21	21 55	359 310
16	13 Virginis	6	18 14	19 4	69 180
16	Uranus	–	21 58	22 44	6 297

April 16 ... h. 12 ... Jupiter in conjunction with and 0° 29′ north of the Moon.

Meteor Showers

Amongst the radiants represented at this season are the following:—Near ψ Ursæ Majoris, R.A. 162°, Decl. 48° N.; from Coma Berenices, R.A. 190°, Decl. 21° N.; from Libra, R.A. 225°, Decl. 5° S.; from Corona, R.A. 240°, Decl. 25° N.; from Hercules, R.A. 265°, Decl. 23° N.; maximum April 13.

GEOGRAPHICAL NOTES

THE sixth German "Geographentag," which will be held at Dresden on the three last days of this month, together with a Geographical Exhibition, will, first of all, bring up the reports of the two travellers, Messrs. Reichard and Lieut. von François, concerning their experiences and observations in Equatorial Africa. Dr. Ed. Naumann will speak on his topographical and geological survey of Japan, and Director A. Matzat, of Weilburg, on drawing in geographical instruction. Further addresses which will be delivered are by Dr. G. Leipold (Dresden), on the raising of the sea-level near the coasts of continents; by Dr. Hahn (Königsberg), on the development and division of coasts from a geographico-commercial point of view; by Dr. P. Lehmann (Berlin), on the significance of Kant for geographical science; by Dr. Egli (Zürich), on the development of the nomenclature of towns, &c.; by Dr. Petri (Berne), on the exploration of Siberia; by Dr. O. Schneider (Dresden), on the closer limitation of geographical terms; and by Dr. S. Ruge (Dresden), on the Central Commission for German topography.

A LETTER was recently read before the Russian Geographical Society on March 17 from M. G. N. Potanin, the leader of another Expedition to Central Asia. At the end of October last the explorer was on his way from Sukhan-Hiln to Lon-djou. He had met great difficulties on this journey; the Expedition having been compelled to march on foot and their luggage to be carried by porters. The direction of the return journey will depend on the success of the proposed passage across the Desert of Gobi. However, this return is secured.

WE have received a communication from M. Grigoriev, Secretary of the Imperial Russian Geographical Society, in which he informs us that Dr. Bunge has left Nasàtchyé, his headquarters, on the Yana River, in command of the Expedition to explore the New Siberian Islands during the summer, and that he is expected back at the end of October or early in November. These islands, which by many Arctic explorers are held to be the right base for an attack on the Pole, are very little known, not having been visited since 1823.

THE Norwegian Storthing has granted a sum of 4500*l.* towards the further geographical survey of Norway.

MR. C. WINNECKE, of South Australia, has prepared a plan showing the contour of the country along the overland telegraph line from Port Augusta to the Queensland boundary, a distance of 1626 miles.

THE SAHARUNPUR BOTANICAL GARDENS

MR. J. F. DUTHIE'S Report on the progress and condition of the Government Botanical Gardens at Saharunpur and Mussoorie for the year ending March 31, 1885, has reached us. It is a bulky Report of some fifty-one pages and a very interesting Report of fifteen pages, on "an examination of the indigenous grasses and other fodder-yielding plants growing on the Hissar Birland," under date September 5, 1885, accompanies it. In the Report on the Gardens, amongst other interesting and important matters Mr. Duthie refers to samples of wheat and barley grown in the Saharunpur Garden, which had attracted some amount of attention in this country. He says:—"Amongst some contributions for the Economic Museum of the Royal Gardens, Kew, which I took to England last year were two samples of grain—one of a variety of wheat called 'Gujaria,' and grown at Saharunpur from selected seed, the original having been received some years since from the Government Farm at Cawnpore; the other a remarkable variety of loose-grained barley, of a dark chocolate colour, from a small sample exhibited at a previous agricultural show at Saharunpur." These samples were considered by the authorities at Kew to be of sufficient interest for their being specially reported on, and they were accordingly sent to Messrs. McDougall Bros., of Millwall Docks, who reported to the effect that the samples had been shown to most of the principal people on the Corn Market, who took much interest in them. The wheat was valued at about 30*s.* per 496 lbs., it being classed with the Kubanca (Russian) wheat, its bright and clean appearance causing much remark. On grinding and pasting it was found to contain much gluten, but to be somewhat sticky. The reporter thinks, however, that it would pay better to grow the white seed, such as is now shipped from Bombay, and realises 39*s.* per 496 lbs. Regarding the barley, the specimen, it is said, was looked upon with much interest, and many opinions expressed upon its being quite new, and the value varied from 23*s.* to 30*s.* per 400 lbs. On damping, the grains were found to sprout well, and so would do for malt, but the colour comes off, and so would not do (it is thought) for pale ales, but it might do well for stout; for feeding purposes it would be useful, although it would take time to remove prejudice against its colour. In some comments on this Report Mr. Duthie says:—"The wheat is a very hard free-growing sort, and always gives a good yield, both in grain and chaff. Last season the yield was 18 maunds and 13 seers chaff per acre. This variety possesses the good quality of being able to stand well up when grown in highly-manured soil; for, as is well known, most varieties of Indian wheat run up into straw and fall over before coming to maturity when the soil is too highly manured. This variety is thus well-adapted for those who attempt to cultivate wheat according to the European method. The chocolate-coloured barley produced 15 maunds grain and 12½ maunds straw per acre. The yield of grain was thus heavier than the yield of straw. The objection as to colour, alluded to in the Report, is fatal to its value, and will prevent its ever being grown except as a curiosity. We possess a white-grained variety of huskless barley, and a good large sample of this has lately been sent to Kew for special report. The huskless barleys appear to be quite unknown in England, and as everything except colour was favourably commented on in the case of the variety sent, I am in hopes that the report on the white variety will be altogether favourable, and perhaps become the means of bringing the barley to the notice of the English market." Mr. Duthie records the introduction of many useful and ornamental plants to the Gardens; and to the Herbarium, he says, large and valued contributions continue to be received, amongst them a very interesting set of specimens from Mr. C. B. Clarke, chiefly belonging to families which have been specially worked up by him in his several monographs contributed to the "Flora of British India" and De Candolle's "Prodromus," also a large collection made by Mr. J. S. Gamble during a tour in the Madras Presidency. Besides which duplicates had been received from Dr. King, of the Calcutta Botanic Garden, and Dr. Trimen of the Peradeniya Botanic Garden, Ceylon. In addition to these contributions, specimens had been placed in the Herbarium collected during Mr. Duthie's expedition to North-Eastern Kumaun. This collection, it is stated, "consists of over 1000 species and varieties, including about 25 new to science, one (*Cystopteris montana*) new to India, and upwards of 128 not previously recorded for Kumaun. The north-eastern portion of Kumaun, including the districts of Dárma and Byáno, had not hitherto been explored botanically, and this, of course, accounts for the large number of new records. Amongst these latter are several which had previously been known only from Nepal and Sikkim. Further investigation will, no doubt, confirm my own conclusions as to the greater similarity of the vegetation along the entire length of the Himalayas as you approach the inner and drier ranges." Mr. Duthie's "Appendix VI.," being "Notes on a Botanical Expedition to North-Eastern Kumaun in 1884," will be read with interest by the botanist interested in Indian plants.